A WEIGELTISAURID REPTILE FROM THE LOWER TRIASSIC OF BRITISH COLUMBIA

by DONALD BRINKMAN

ABSTRACT. The skull of a new weigeltisaurid reptile, *Wapitisaurus problematicus* gen. et sp. nov., from the Lower Triassic Vega-Phoroso Member of the Sulphur Mountain Formation is described. It shares with *Coelurosauravus*, the only other known weigeltisaurid, the presence of an incomplete lower temporal arcade, a jugal with reduced postorbital process, and a squamosal crest ornamented with tooth-like projections. It differs from *Coelurosauravus* in its large size and in the structure and implantation of the teeth.

WHILE marine reptile faunas of the Upper Permian and Middle Triassic are well known, those of the Lower Triassic are very incompletely understood, so that the discovery of marine reptiles in the Lower Triassic Vega-Phoroso Member of the Sulphur Mountain Formation greatly increases our understanding. These beds have been known for their abundant and well-preserved vertebrate fauna since 1949 (Laudon *et al.* 1949). The fish fauna has been described by Schaeffer and Mangus (1976) and Neuman (1986), and reptile remains were noted by Schaeffer and Mangus, but only recently has diagnostic material been collected. This includes ichthyosaur remains, currently being studied by J. Callaway and D. Brinkman, and the skull of a peculiar reptile described here.

Geological occurrence

The Vega-Phoroso Member of the Sulphur Mountain Formation (Gibson 1972, 1975) consists of flaggy weathering shale at its base that intertongues with, and is overlain by, a sequence of rusty brown siltstones. This member is interpreted as having been deposited in a restricted, relatively deep-water environment, although some evidence indicates that at times deposition may have been above active wave base (Gibson 1975). The Vega-Phoroso Member is entirely Lower Triassic in age. It ranges from the Griesbachian to the Spathian with most collections being dated as Smithian largely on the basis of pelecypods. The specimen described here was found in a scree slope derived from the siltstone facies of the Member, but the position of the exposure from which the scree originated could not be determined. Thus the exact age of the specimen is uncertain, although a Smithian age is likely.

SYSTEMATIC PALAEONTOLOGY

Class REPTILIA
Subclass DIAPSIDA
Family WEIGELTISAURIDAE Kuhn, 1939
Genus WAPITISAURUS gen. nov.

Type species. *Wapitisaurus problematicus* sp. nov.

Etymology. Refers to Wapiti Lake, a large lake about 4 km north of the type locality.

Diagnosis. Differs from *Coelurosauravus* in its large size, subthecodont tooth implantation, and presence of few, short, laterally compressed teeth that are about as wide at their base as they are high. The postcranial skeleton is unknown.

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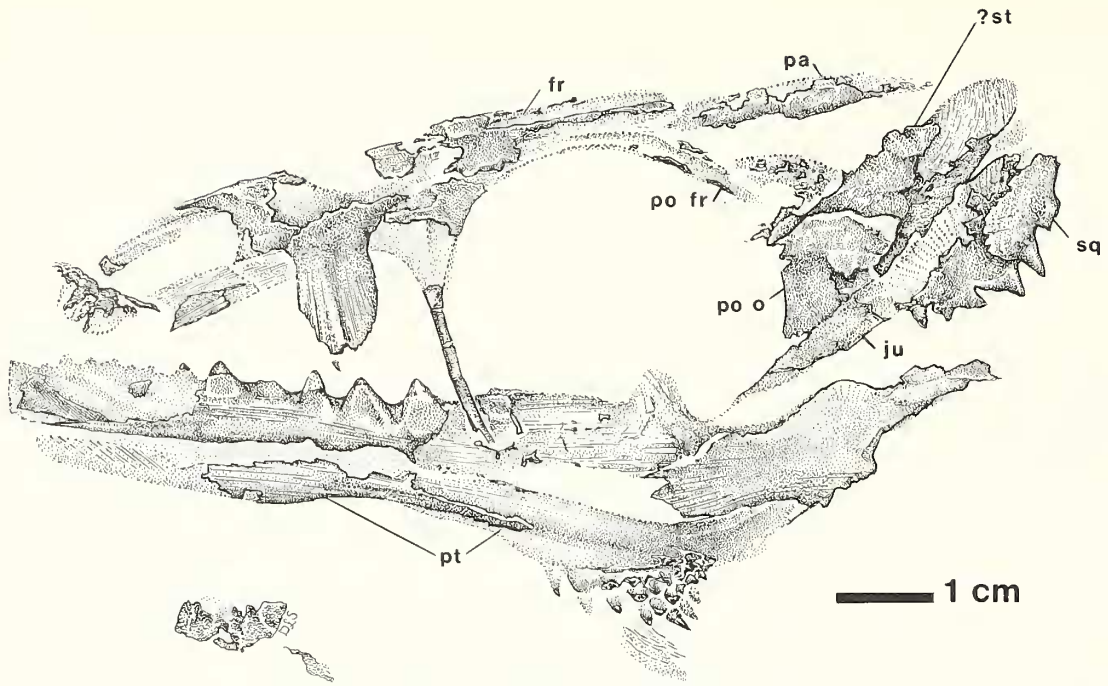

TEXT-FIG. 1. The type specimen of *Wapitisaurus problematicus* gen. et sp. nov. (TMP 86.153.14). Abbreviations: fr, frontal; ju, jugal; pa, parietal; po fr, postfrontal; po o, postorbital; pt, pterygoid; sq, squamosal; st, supratemporal.

Wapitisaurus problematicus sp. nov.

Text-fig. 1

Etymology. Named for the taxonomic and anatomical problems raised by the type specimen.

Holotype. Tyrrell Museum of Palaeontology, specimen number TMP 86.153.14. Partial skull seen in left lateral view, lacking the maxilla and premaxilla. The left pterygoid and left lower jaw are preserved below the skull.

Horizon and locality. From the Vega-Phoroso Member of the Sulphur Mountain Formation. Type locality: UTM 647,000 E., 6045000 N., Zone 10, map 93 I/10. Near Wapiti lake, British Columbia, Canada.

Specific diagnosis. As for the genus.

DESCRIPTION

The general proportions of the skull (text-fig. 1) are clear: the orbit is large, the postorbital region is slightly shorter than the diameter of the orbit, and the ventral margin of the skull sweeps upward posterior to the orbit. In general, these proportions are similar to those of *Coelurosauravus* as reconstructed by Evans and Haubold (1987), although the postorbital region is shorter relative to the length of the orbit than in that genus.

The postorbital region is nearly completely preserved on the left side of the skull and the squamosal, postorbital, postfrontal, frontal, and jugal remain in articulation. A fragment of bone preserved in the position of the parietal may represent a part of that element. Most of these bones are represented by impressions of the internal surface of the bones or by broken bone surface, but part of the external surface of the postorbital and squamosal is preserved. An element with tooth-like ornamentation is visible within the upper temporal opening. This is either the right squamosal or a supratemporal.

The arrangement of the bones forming the postorbital region is much like that of *Coelurosauravus*. The frontal forms much of the orbital margin. The postfrontal is a small crescent-shaped bone extending along the margin of the orbit between the frontal and postorbital. The postorbital forms the posterior margin of the orbit and contacts the squamosal and jugal ventrally. The posterior edge of the postorbital is incompletely preserved, but it must have been large and generally triangular in shape. The squamosal forms the ventral margin of the postorbital region of the skull. As in *Coelurosauravus*, it sweeps upwards from the ventral edge of the orbit giving the postorbital region a crest-like aspect. Also, as in *Coelurosauravus*, the ventral edge of the squamosal is ornamented by small, irregular tooth-like projections, of which six are present on the preserved part of the bone. The ornamentations on the element visible through the upper temporal opening do not match those of the left squamosal. Thus this element may represent a supratemporal which Evans and Haubold (1987) have shown to be ornamented also in *Coelurosauravus*. The posterior end of the jugal is preserved, and the contact of the jugal with the postorbital can be identified, but the contact with the squamosal is obscured. The jugal extends anteriorly from the postorbital as a narrow bar below the orbit. A posterior process is not present.

Impressions of some of the bones of the face are present. These show that the eye was large and bordered anteriorly by a thickened ridge. The identity of the bones in this area and the position of sutures is, however, uncertain.

A left pterygoid is preserved below the skull. Numerous conical, recurved teeth are present on the transverse flange region of the bone. They increase in size towards the lateral edge of the bone. They are not organized into distinct rows or tooth patches, but form a uniform covering over the entire surface of the preserved portion of the transverse flange.

Most of the left lower jaw is present, only the tip of the dentary and the lower edge of the postdentary being missing. The dentary is represented by impression and by broken bone surface, and the postdentary region by impression and by the lateral surface of its posterior end. The sutural contact between the dentary and postdentary regions can be clearly identified. No sutures can be recognized in the postdentary region.

The dentary is a rather slender bone bearing ten teeth. The posterior teeth are nearly completely preserved. These are broad-based and laterally compressed, about as high as they are wide, and with sharp conical tips. The anterior teeth are represented by impressions in the matrix. They are shorter, smaller, and tend to be more conical. The base of the teeth extends into the body of the bone, at least in the case of the most posterior two teeth, indicating that tooth implantation is subthecodont. The most posterior tooth is located well anterior to the posterior end of the dentary.

The dorsal margin of the postdentary region sweeps upward, corresponding to the upward sweep of the ventral edge of the postorbital region of the skull. The preserved portion of the lower jaw extends to the region where an articular would be expected. A swelling of the bone in this area may represent the lateral expression of the articular. If correctly identified, this indicates that the jaw joint was located relatively further posteriorly than in *Coelurosauravus*, which Evans and Haubold (1987) have shown to be located just posterior to the orbit.

RELATIONSHIPS

The Weigeltisauridae (Coelurosauravidae of Evans, 1982), most recently reviewed by Carroll (1978), Evans (1982), and Evans and Haubold (1987), are a family of small lizard-like primitive diapsids represented by one genus, *Coelurosauravus*, from the Upper Permian of Europe and Madagascar. It has a number of derived features of the cranial and postcranial skeleton, the most striking of which is the elongation of the ribs to form a gliding structure. Derived features of the skull listed by Evans (1982) and Evans and Haubold (1987) are: pleurodont or subpleurodont dentition, ornamented squamosal and supratemporal, long straight postparietal processes, incomplete lower temporal arcade, and jugal with reduced posterior process. *Wapitisaurus* shares with *Coelurosauravus* the following traits: ornamented squamosal, incomplete lower temporal arcade, jugal with reduced posterior process, and lacrimal small or absent. In addition, the proportions of the skull of *Wapitisaurus* are similar to those of *Coelurosauravus*: the orbit is large and the ventral margin of the postorbital region slopes upward from the ventral margin of the orbit.

There are, however, a number of features in which *Wapitisaurus* is different from *Coelurosauravus* which bring this assignment into question. One of these is its large size. The kind of gliding adaptations seen in *Coelurosauravus* may well have an upper size limit, raising the possibility that

Wapitisaurus did not have similar adaptations. However, by analogy with agamids, the absence of gliding adaptations in *Wapitisaurus* would not prevent these two genera being considered members of a single family, since the Agamidae contains genera that are gliding and genera that have a normally constructed postcranial skeleton.

A second difference between *Wapitisaurus* and *Coelurosauravus* is in the structure of the teeth. Those of *Coelurosauravus* are small, numerous, and conical, presumably a primitive condition, and, as interpreted by Evans and Haubold (1987), have a pleurodont or subpleurodont implantation. Those of *Wapitisaurus* have a subthecodont implantation and are derived in being few in number, and in that the posterior teeth are stoutly constructed.

Teeth like those of *Wapitisaurus* are also seen in two groups of marine reptiles from the Triassic, the Thalattosauria and the Ichthyopterygia. Thus an alternative to the hypothesis that *Wapitisaurus* is related to *Coelurosauravus* is that it is a member of one of these groups.

The Thalattosauria is a group known from the Middle Triassic (Merriam 1905; Peyer 1936; Rieppel 1987). They differ from *Wapitisaurus* and *Coelurosauravus* in the structure of the postorbital region of the skull. In the thalattosaurs, the upper temporal opening has been reduced or lost, and a large lower temporal opening is present (Rieppel 1987). This contrasts with the condition in *Wapitisaurus* and *Coelurosauravus* where the lower temporal opening has been lost and the postorbital region is relatively short. Thus the hypothesis that *Wapitisaurus* and thalattosaurs are related is not corroborated by other features in the structure of the skull.

The second group of Triassic marine reptiles that have a dental arrangement like that of *Wapitisaurus* are the ichthyosaurs. Primitive ichthyosaurs such as *Grippa* (Mazin 1981) are similar to *Wapitisaurus* in that the posterior teeth are blunt, crushing teeth and the anterior teeth are conical. *Wapitisaurus*, *Coelurosauravus*, and primitive ichthyosaurs are also similar in that the orbit is large, the lower temporal bar has been lost, the jugal is without a posterior process, and the cheek region has been shortened. Using primitive diapsids such as *Petrolacosaurus* (Reisz 1981) and *Acerodontosaurus* (Currie 1980) as outgroups, these can be interpreted as derived features. However, the postorbital region of the skulls of *Wapitisaurus* and *Coelurosauravus* is very different from that of ichthyosaurs. In *Coelurosauravus* the quadratojugal is small and the supratemporal is a large element located behind the upper temporal opening. In ichthyosaurs the quadratojugal is large, the squamosal forms the posterior border of the upper temporal opening, and a supratemporal is absent (Romer 1968; McGowan 1973). Assuming that the homologies of the temporal bones are correctly interpreted, a phylogenetic relationship between ichthyosaurs and *Coelurosauravus* is unlikely. *Wapitisaurus*, as interpreted here, is similar to *Coelurosauravus* in preserved portions of the postorbital region, so the similarities in the structure of the teeth of *Wapitisaurus* and ichthyosaurs are best interpreted as parallel developments. Thus at present, a relationship between *Coelurosauravus* and *Wapitisaurus* is considered the most strongly supported hypothesis of relationships.

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